

APPELLANTS' BRIEF ON APPEAL

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)	
)	
Naimul Karim et al.)	Examiner: Christopher M. Koehler
)	
Serial No.: 10/749,306)	Group Art Unit: 3726
)	
Filed: December 31, 2003)	Docket: 59378US002
)	(102.0084US01)
)	
For: Curable Dental Mill Blanks)	
and Related Methods)	

APPELLANTS' BRIEF ON APPEAL

Mail Stop Appeal Brief
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

1. REAL PARTY IN INTEREST

The real party in interest of the above-captioned patent application is the assignee, 3M Innovative Properties Company.

2. **RELATED APPEALS AND INTERFERENCES**

Applicants are aware of no prior or pending appeals, judicial proceedings or interferences which may be related to, directly affect or be directed affected by, or having a bearing on the Board's decision in the pending appeal.

3. **STATUS OF THE CLAIMS**

Claims 1-45 are pending in the application. Claims 28-45 have been withdrawn from consideration. Claims 1-27 have been rejected and are now the subject of this appeal. The rejections of each of claims 1-27 is appealed. A complete listing of the pending claims is provided in the Claims Appendix at the end of this brief.

4. STATUS OF AMENDMENTS

The last office action was mailed on January 11, 2008. In response Applicants filed a notice of appeal. Applicants do not believe that any outstanding amendments have not been entered.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The invention features a dental mill blank constructed from an uncured, self-supporting, hardenable organic composition. The invention also provides a method of making a dental appliance. The method involves machining an uncured dental mill blank into an uncured shaped article and then at least partially curing the shaped article. The shaped article may be cured in multiple steps with or without additional machining steps in between the curing steps.

The present invention is directed in part, as indicated by claim 1, to a method of making a dental appliance, said method comprising: providing a dental mill blank comprising a substantially uncured, self-supporting, hardenable organic composition; machining the mill blank into a substantially uncured shaped article; and at least partially curing the shaped article to provide a hardened dental appliance. Support for claim 1 is found, for example, at page 2, lines 23 to page 4, line 16.

The present invention is further directed in part, as indicated by claim 27, to a method of making a dental appliance, the method comprising: providing a dental mill blank comprising a substantially uncured, self-supporting, hardenable organic composition; machining the mill blank into a preformed article; partially curing the preformed article to provide a partially cured article; machining said partially cured article to form a shaped article; and at least partially curing said shaped article to provide a hardened dental appliance. Support for claim 27 is found, for example, at page 4, lines 17 to 26.

More generally, the present invention overcomes disadvantage arising from machining ceramic mill blanks is that these materials are very hard, which results in long machining times and a high degree of wear on the tool. The cost of machining such blanks is therefore very high.

The present invention features a dental mill blank comprising a substantially uncured, self-supporting, hardenable organic composition. Typically, the mill blank is made of a wax-like, composite material that has sufficient hardness at room temperature to be milled. Since the mill blank of the invention is constructed of an uncured material, it is generally softer than ceramic mill blanks or mill blanks made of a hardened composite. Thus, by using mill blanks made of an uncured, organic composition for fabrication of dental appliances, the machining tools used for milling the blanks are subject to less wear, which results in tools having a longer

service life and in considerably reduced costs. In addition, dental appliances may be fabricated with faster machining times.

The dental mill blanks of the invention may be made of a variety of hardenable or polymerizable materials, including an uncured composite material. In one embodiment, the mill blank comprises a polymerizable resin system, an optional filler system, and an initiator system. The mill blank may also include one or more viscosity modifiers and/or a surfactant system.

The polymerizable resin system may comprise a crystalline component, which may include, for example, one or more polyester, polyether, polyolefin, polythioether, polyarylalylene, polysilane, polyamide, polyurethane, or combinations thereof. Alternatively, the crystalline component may be a non-polymeric material. The crystalline component can optionally have a dendritic, hyperbranched, or star-shaped structure.

The dental mill blanks and related methods of the invention can be used in the fabrication of a variety of dental appliances, including, for example, dental restoratives and dental prostheses, such as crowns and bridges, inlays, onlays, veneers, implants, implant support structures, dentures, and artificial teeth, as well as dental impression trays, orthodontic appliances (e.g., a retainer, a night guard, a bracket, a buccal tube, a band, a cleat, a button, a lingual retainer, a bite opener, a positioner, and the like), tooth facsimiles or splints, maxillofacial prosthesis, and other customized structures.

By using the dental mill blanks and related methods of the invention, it is possible to fashion custom dental prosthetics in less time, with less wear on the machining tools, resulting in longer tool life and lower costs for machining. It is also possible to use a less expensive, smaller machine as well as less expensive cutting tools.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

 A. Whether claims 1-7, 13-17 and 19-27 are anticipated by Freilich et al. (6,599,125) under 35 U.S.C. 102(e).

 B. Whether claims 1-27 are obvious over Freilich et al. (6,599,125) in view of Karim et al. (2003/0114553).

7. ARGUMENT

A. **Claims 1-7, 13-17 and 19-27 are not anticipated by Freilich et al. (6,599,125) under 35 U.S.C. 102(e)**

Claims 1-7, 13-17 and 19-27 have been improperly rejected under 35 USC Section 102(e) as being anticipated by Freilich et al. (U.S. Patent No. 6,599,125). This rejection is erroneous because Freilich teaches dental materials that must be at least partially cured to be machinable, in contrast to the pending claims which require a substantially uncured, self-supporting, hardenable organic composition for machining.

1. **Freilich teaches materials that must be at least partially cured to be machineable, in stark contrast to the substantially uncured materials of the present invention.**

The pending claims include the step of providing a dental mill blank comprising a substantially uncured, self-supporting, hardenable organic composition; and then machining the mill blank into a substantially uncured shaped article. As defined in the application, "substantially uncured" means that the composition has been cured to an extent of less than 10%, typically less than 5%, and more typically less than 1% whether by incidental or intentional curing mechanisms." Page 7, lines 7 to 10.

In contrast with the present invention, in which materials are left substantially uncured prior to machining, Freilich teaches that the material for forming dental components is required to be at least partially cured before machining. The abstract of Freilich states that the "polymeric material is partially or fully cured to the point of sufficient hardness to produce a ready-to-use structural component for use in fabrication of dental appliances. . . ." See also column 1, line 67 to column 2, line 2, which states that the material must be cured to the point of sufficient hardness to provide a component for use in the fabrication of dental appliances.

The teachings of Freilich are explicit that very low levels of curing (termed "uncured or slightly partially cured") for its materials results in compositions that are very soft and flexible, and may be modified by a variety of methods, including forming, shaping, contour, adjusting, etching, etc. See column 2, line 38 and lines 50 to 53. Thus, Freilich explicitly teaches that

uncured or slightly cured compositions are very soft and flexible, and thus unsuitable for machining, while cured and partially cured sections are substantially hard (see also column 2, lines 44 to 46).

2. Freilich teaches that uncured materials are not machineable, in contrast with the claimed invention that explicitly calls for machining uncured mill blanks into substantially uncured shaped articles

Freilich fundamentally teaches that a material must be cured before machining. From the specification, it is evident that Freilich requires this curing in order to make the material suitable for handling and processing. In other words, Freilich asserts that the material must be cured in order to be machined. This is strong contrast to the present case, where the material does *not* require curing in order to be handled and milled, and claims as such that the material be substantially uncured.

See, for example, column 6, lines 57 to 60 of Freilich et al. (cited by the examiner). Here, complicated shapes are formed by fully or partially curing composite material to a hardness sufficient to withstand cutting. This is in stark contrast to the present claimed invention that avoids curing before machining. Other teachings within Freilich of prefabricated components require that the components be fully or partially cured. See, e.g., column 9, lines 3 to 4. As stated in Freilich, the materials undergo polymerization to impart sufficient hardness to withstand cutting, carving or machining. Column 8, lines 13 to 17.

As noted above, the present invention discloses a method whereby a dental mill blank that is substantially uncured, self-supporting, and hardenable is machined into a substantially uncured shaped article. This disclosure is the opposite of the teachings of Freilich, which state that if material is left uncured, then it is modified by forming, shaping and contouring by hand or by using hand instruments. Column 6, lines 50 to 53. Uncured material is not machineable. See Column 2, lines 50 to 54.

In this regard, it is clear that the teachings of the present invention, which calls for a substantially uncured mill blank to be milled, is in direct opposition to the teachings of Freilich, which allow only for non-machining process of uncured mill blanks. The present invention teaches a material that seeks to eliminate curing before further processing; while Freilich

emphasizes the need to cure dental material before machining. Therefore, it is clear that Freilich fails to teach the element of the pending claims that a substantially uncured material be used. For this reason, Applicants respectfully assert that the pending claims are not anticipated by Freilich et al.

B. Claims 1-27 are not obvious over Freilich et al. (6,599,125) in view of Karim et al. (2003/0114553).

Claims 1-27 were rejected under 35 USC Section 103(a) as being unpatentable over Freilich et al. (U.S. Patent No. 6,599,125) in view of Karim et al. (PUB 2003/0114553).

Applicants respectfully disagree. As noted above, the teachings of Freilich are in conflict with those of the present invention. In addition, nothing in Karim resolves the deficiencies of Freilich. Therefore, Applicants respectfully assert that the present invention is non-obvious in view of the combination of Freilich and Karim.

Karim is directed to hardenable self-supporting structures and methods. Karim discloses and claims compositions, particularly for forming dental products, having a hardenable self-supporting structure with sufficient malleability to be subsequently customized into a second shape and then hardened, and methods. Thus, the teachings of Karim are directed toward materials having sufficient internal strength to be formed into a desired shape that can be maintained during transportation and storage and with sufficient malleability to be subsequently customized into a second shape and then hardened. These materials can be used in a variety of applications, including oral prosthetic devices such as inlays, onlays, veneers, temporary crowns, permanent crowns, bridges, as well as fillings, orthodontic appliances, tooth facsimiles or splints, and dental impression trays.

In contrast, the pending claims include the step of providing a dental mill blank comprising a substantially uncured, self-supporting, hardenable organic composition; and then machining the mill blank into a substantially uncured shaped article. As such, the objective of the present invention is not to create a malleable composition, but rather to create a machineable composition. Therefore, applicants believe Karim to be improperly used to reject the pending claims, since Karim essentially teaches away from the present invention.

8. SUMMARY

The present invention features a dental mill blank constructed from an uncured, self-supporting, hardenable organic composition. In contrast to the present invention, in which materials are left substantially uncured prior to machining, the prior art teaches that the material for forming dental components is required to be at least partially cured before machining. Thus, the prior art fails to anticipate or make obvious the claimed invention, and therefore the present invention is in a condition for allowance.

August 11, 2008

Date

Respectfully submitted,

/ Daniel M. Pauly /

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APPENDIX I

The Claims on Appeal

1. (Previously Presented) A method of making a dental appliance, said method comprising:

- (a) providing a dental mill blank comprising a substantially uncured, self-supporting, hardenable organic composition;
- (b) machining the mill blank into a substantially uncured shaped article; and
- (c) at least partially curing the shaped article to provide a hardened dental appliance.

2. (Original) The method of claim 1, wherein the organic composition comprises a substantially uncured composite material.

3. (Original) The method of claim 2, wherein the composite material comprises a polymerizable resin system and an initiator system.

4. (Original) The method of claim 3, wherein the composite material further comprises a filler system.

5. (Original) The method of claim 4, wherein the polymerizable resin system comprises a crystalline component.

6. (Original) The method of claim 5, wherein the crystalline component is non-polymeric.

7. (Original) The method of claim 5, wherein the crystalline component comprises one or more polyester, polyether, polyolefin, polythioether, polyarylalkylene, polysilane, polyamide, polyurethane, or combinations thereof.

8. (Original) The method of claim 7, wherein the crystalline component comprises saturated, linear, aliphatic polyester polyols containing primary hydroxyl end groups.
9. (Original) The method of claim 8 wherein the hydroxyl end groups are modified to introduce polymerizable unsaturated functional groups.
10. (Original) The method of claim 5, wherein the crystalline component has a dendritic, hyperbranched, or star-shaped structure.
11. (Original) The method of claim 4, wherein the polymerizable resin system comprises at least one ethylenically unsaturated component.
12. (Original) The method of claim 11, wherein the ethylenically unsaturated component is selected from mono-, di-, or poly-acrylates and methacrylates, unsaturated amides, vinyl compounds, and combinations thereof.
13. (Original) The method of claim 4, wherein at least a portion of the filler system comprises particulate filler.
14. (Original) The method of claim 4, wherein the filler system comprises an inorganic material comprising nanoscopic particles.
15. (Original) The method of claim 4, wherein the initiator system comprises a free radical initiator.
16. (Original) The method of claim 4, wherein the initiator system comprises a photoinitiator or a thermal initiator.
17. (Original) The method of claim 4, wherein the mill blank further comprises a

viscosity modifier.

18. (Original) The method of claim 4, wherein said mill blank further comprises a surfactant system.

19. (Original) The method of claim 1, wherein said dental appliance is a crown, an inlay, an onlay, a bridge, a veneer, an orthodontic appliance, a maxillofacial prosthesis, a tooth facsimile, or a tooth splint.

20. (Original) The method of claim 1, further comprising the step of processing the hardened dental appliance.

21. (Original) The method of claim 20, wherein the processing comprises surface treating, trimming, polishing, coating, priming, staining, or glazing the hardened dental appliance.

22. (Original) The method of claim 1, wherein said machining comprises milling the mill blank using computer-controlled milling equipment.

23. (Original) The method of claim 22, wherein the computer-controlled milling equipment comprises a CAD/CAM device.

24. (Original) The method of claim 1, wherein a second machining step is performed after said curing step.

25. (Original) The method of claim 24, wherein a second curing step is performed after said second machining step.

26. (Original) The method of claim 25, wherein said second curing step is performed under different conditions from the initial curing step.

27. (Original) A method of making a dental appliance, said method comprising:

- (a) providing a dental mill blank comprising a substantially uncured, self-supporting, hardenable organic composition;
- (b) machining the mill blank into a preformed article;
- (c) partially curing the preformed article to provide a partially cured article;
- (d) machining said partially cured article to form a shaped article; and
- (e) at least partially curing said shaped article to provide a hardened dental appliance.

28. (Withdrawn) A dental mill blank comprising a substantially uncured, self-supporting hardenable organic composition.

29. (Withdrawn) The dental mill blank of claim 28, wherein the organic composition comprises a substantially uncured composite material.

30. (Withdrawn) The dental mill blank of claim 29, wherein the composite material comprises a polymerizable resin system and an initiator system.

31. (Withdrawn) The dental mill blank of claim 30, wherein the composite material further comprises a filler system.

32. (Withdrawn) The dental mill blank of claim 31, wherein the polymerizable resin system comprises a crystalline component.

33. (Withdrawn) The dental mill blank of claim 32, wherein the crystalline component is non-polymeric.

34. (Withdrawn) The dental mill blank of claim 32, wherein the crystalline component comprises one or more polyester, polyether, polyolefin, polythioether, polyarylkylene, polysilane, polyamide, polyurethane, or combinations thereof.

35. (Withdrawn) The dental mill blank of claim 34, wherein the crystalline component comprises saturated, linear, aliphatic polyester polyols containing primary hydroxyl end groups.

36. (Withdrawn) The dental mill blank of claim 35, wherein the hydroxyl end groups are modified to introduce polymerizable unsaturated functional groups.

37. (Withdrawn) The dental mill blank of claim 32, wherein the crystalline component has a dendritic, hyperbranched, or star-shaped structure.

38. (Withdrawn) The dental mill blank of claim 31, wherein the polymerizable resin system comprises at least one ethylenically unsaturated component.

39. (Withdrawn) The dental mill blank of claim 38, wherein the ethylenically unsaturated component is selected from mono-, di-, or poly-acrylates and methacrylates, unsaturated amides, vinyl compounds, and combinations thereof.

40. (Withdrawn) The dental mill blank of claim 31, wherein at least a portion of the filler system comprises particulate filler.

41. (Withdrawn) The dental mill blank claim 31, wherein the filler system comprises an inorganic material comprising nanoscopic particles.

42. (Withdrawn) The dental mill blank of claim 31, wherein the initiator system comprises a free radical initiator.

43. (Withdrawn) The dental mill blank of claim 31, wherein the initiator system comprises a photoinitiator or a thermal initiator.

44. (Withdrawn) The dental mill blank of claim 31 further comprising a viscosity modifier.

45. (Withdrawn) The dental mill blank of claim 31 further comprising a surfactant system.

APPENDIX II

Evidence Appendix

None.

APPENDIX III

Related Pleadings Appendix

None.